PROTECTION OF GENETIC RESOURCES OF POMOLOGICAL PLANTS AND SELECTION OF GENITORS WITH TRAITS VALUABLE FOR SUSTAINABLE FRUIT PRODUCTION

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INVESTIGATION ON RESISTANCE TO LEAF SPOT DISEASE, (*Blumeriella jaapi*), IN CHERRIES

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A B S T R A C T

An artificial inoculation test method with leaf disks was established in the laboratory. The resistance to leaf spot of 51 sour cherry cultivars, 7 sweet cherry cultivars and 11 *Prunus* species was evaluated in lab tests. In result of these resistant screening tests, 8 sour cherry cultivars showed a resistant reaction to leaf spot. All tested sweet cherry cultivars were susceptible. The tested *Prunus* species, *P. sargentii*, *P. serrulata* var. *spontanea*, *P. subhirtella pendula rosea*, *P. incisa*, *P. canescens*, *P. kurilensis*, *P. nipponica*, *P. maackii* showed a resistant reaction type to the leaf spot fungus. *P. dawyckensis* was susceptible.

Key words: *Prunus cerasus*, *P. avium*, *Prunus* ssp., *Blumeriella jaapi*, leaf spot resistance

INTRODUCTION

Cherry leaf spot, caused by the fungus *Blumeriella jaapi* (Rehm) v. Arx. (syn. *Coccomyces hiemalis* Higgins), is one of the most serious fungal diseases of sour and sweet cherries. The disease mainly affects the leaves. Diseased leaves drop prematurely, and strongly affected trees may be defoliated by mid-summer. Infection by leaf spot fungus reduces tree vigour and winter-hardiness of buds and wood. Little information exists about the resistance of common sour and sweet cherry cultivars and wild cherry species. Leaf spot is common in cherry growing areas in North America and Europe. In Europe it was reported first in the middle of the 20th century. In the past only few reports have been published about leaf diseases in nurseries

and young plantings. The perfect stage of the leaf spot fungus was detected first in the Netherlands (Roosje, 1964), Poland (Burkowicz, 1964), Hungary (Kaszonyi, 1966) and Germany (Kennel, 1968; Burth et al., 1970). In the last decades, the fungus has spread all over the cherry growing areas of Europe.

MATERIAL AND METHODS

Reaction to leaf spot inoculation was evaluated on 51 sour cherry cultivars, 7 sweet cherry cultivars and 11 wild cherry species from the Genebank of the Fruit Breeding Institute Dresden-Pillnitz.

Two young leaves from genotypes grafted on rootstocks Piku 1 or Piku 3 (grown in greenhouse) were used for the leaf tests. Leaves or leaf parts were placed in Petri dishes on filter paper soaked with 1% solution of sucrose. The leaves of each genotype were placed in two different Petri dishes. Conidial suspensions of leaf spot fungus, 1x 10^6 conidia/ml, prepared from dried naturally infected sweet and sour cherry leaves were used for the inoculations. In 2002 and 2003 screening for resistance was carried out in the laboratory. After 12 days, the reaction type was characterised according to the following scale.

Reaction type:

0 no symptoms, green leaf
1 scattered small pigmented lesions, chlorotic or necrotic points
2 larger lesions, partly with arial mycelium and stunted sporulating acervuli
3 2 to 10 sporulating acervuli
4 11 or more sporulating acervuli
(modified after Wharton et al., 2003)

The reaction types 0 to 2 were classify to resistant genotypes and the reaction types 3 and 4 to susceptible genotypes.

RESULTS AND DISCUSSION

An artificial inoculation test method was established in the laboratory. In result of the leaf tests, 8 sour cherry cultivars showed a resistant reaction type to leaf spot (reaction type 0-2). 43 sour cherries cultivars and all tested sweet cherry cultivars were susceptible (reaction type 3-4). The tested *Prunus* species, *P. canescens*, *P. incisa*, *P. kurilensis*, *P. maackii*, *P. nipponica*, *P. sargentii*, *P. serrulata* ssp. *spontanea* and *P. subhirtella* 'Pendula Rosea'

showed a resistant reaction type to the leaf spot fungus. The species *P. dawyckensis* was susceptible (Tabs 1-3).

Table 1. Results of leaf segment assay for resistance to leaf spot – sour cherry cultivars

Cultivar	Reaction type**	Cultivar	Reaction type**
Achat	4	Ludwigs Frühe	3
Almaz*	0	Mari timpurii	3
Ciganus 59	2	Meteor korai	3
Csengödi	3	Morina	2
Debreceni bötermö	3	Nana	4
Dropia	3	Oblačinskaja	3
Erdi nagy gymöstesü	3	Paljus*	2
Eugenie Imperatrice	4	Pamjatch Vavilova	3
Fanal	4	Pandy 2	3
Favorit	4	Pieraszt	4
Ferracida	3	Pitic de Dragoslaven	3
Gerema	4	Pitic de Jasi	3
Haaks Dunkelsaftige	4	Röhrigs Weichsel	3
Hartaer	3	Rubellit	4
Hartei	1	Safir	3
Jade	3	Schattenmorelle	4
Kantorjanosi	3	Schirpotreb	4
Karneol	1	Schöne von Montreuil	3
Kistiewa	4	Schwäbische Weinweichsel	4
Korai Pipacsmeggy	1	Studenskaja	4
Korall	4	Tarina	3
Köröser Gierstädt	2	Topas	4
Korund	3	Tschernokorka	4
Lara	4	Turgenjevka	4
Leitzkauer	4	Ujfehertoi fürtös	4
Leopolds Kirsche	4		

*interspecific hybrid

**see Material and Methods

Table 2. Results of leaf segment assay for resistance to leaf spot – sweet cherry cultivars

Cultivar/clone	Reaction type*
Krupnoplodnaja	4
Lapins	3
Namati	4
Napoleon	4
Naprumi	4
Sunburst	4
Vinka	4

* see Material and Methods

The investigations show that the artificial inoculation of leaves in the laboratory is a quick and easy screening method to evaluate leaf spot resistance. The use of dry natural infected leaves as source of the conidia for the inoculations is very efficient. With this method it is possible to get a high amount of conidia for the

inoculation. All results of the artificial leaf tests have to be confirmed with the evaluation results in the orchard in the next years.

Table 3. Results of leaf segment assay for resistance to leaf spot – wild cherry species

Species	Reaction type*
Prunus canescens	1
P. dawyckensis	4
P. incisa	1
P. incisa 'Incana'	1
P. kurilensis	1
P. maackii	1
P. nipponica	1
P. sargentii clone 34	1
P. sargentii 'Rancho'	1
P. serrulata ssp. *Spontanea*	1
P. subhirtella ssp. *Pendula rosea*	1

* see Material and Methods

The sour cherry cultivars 'Morina', 'Köröser Gierstädt', 'Hartai' and 'Karneol' which have a resistant reaction type (0-2) to leaf spot could be a valuable material for the use in sour cherry breeding. The tetraploid cultivars 'Almaz' and 'Paljus' are interspecific hybrids with a low fertility. Shukov et al. (1988) and Wharton et al. (2003) reported the high resistance of 'Almaz'. The cultivar 'Morina' can be recommend for fruit production. 'Morina' was selected from a cross combination 'Köröser' x 'Reinhardts Ostheimer'' in Dresden-Pillnitz (Wolfram, 1990). This cultivar has a good suitability for canning and processing and is tolerant to brown rot caused by *Monilinia laxa*.

The best resistance reaction was shown on the investigated cherry wild species. The diploid species are a good pool for genetic studies of leaf spot resistance and possible sources of resistance genes for introgressing into sweet cherry. The tetraploid wild species *P. maackii* will be used as resistance donor for sour cherry breeding.

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BADANIE ODPORNOŚCI WIŚNI I CZEREŚNI NA DROBNĄ PLAMISTOŚĆ LIŚCI DRZEW PESTKOWYCH (*Blumeriella jaapi*)

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STRESZCZENIE

W warunkach laboratoryjnych, po sztucznej inokulacji, badano podatność na drobną plamistość liści drzew pestkowych 51 odmian wiśni, 7 odmian czereśni oraz 11 różnych gatunków należących do rodzaju *Prunus*. Osiem odmian wiśni okazało się odpornych na tę chorobę, natomiast wszystkie badane odmiany czereśni były na nią wrażliwe. Spośród różnych gatunków rodzaju *Prunus P. sargentii, P. serrulata* var. *spontanea, P. subhirtella pendula rosea, P. incisa, P. canescens, P. kurilensis, P. nipponica, P. maackii* wykazywały odporność na drobną plamistość liści drzew pestkowych, natomiast *P. dawyckensis* był wrażliwy.

Słowa kluczowe: wiśnia (*Prunus cerasus*), czereśnia (*P. avium*), *Prunus* spp., drobna plamistość liści drzew pestkowych (*Blumeriella jaapi*)